PREVALENCE AND RISK FACTORS ASSOCIATED WITH HERPES SIMPLEX VIRUS 2 TYPE IN A COHORT OF WOMAN: A SECONDARY ANALYSIS

by

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DECLARATION

I declare that **PREVALENCE AND RISK FACTORS ASSOCIATED WITH HERPES SIMPLEX VIRUS TYPE 2 IN A COHORT OF WOMAN: A SECONDARY ANALYSIS** is my own work and that the sources that I have used or quoted have been indicated and acknowledged by means of complete references And that this work has not been submitted before for any other degree at any other institution.

_____ _____

Vermala Juggernath **Date**

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ABSTRACT

Background: Herpes Simplex Virus Type 2 (HSV 2) is one of the most common sexually transmitted infections (STIs) worldwide. HSV 2 infection is a risk factor for the acquisition and transmission of other STIs.

Aim: The aim of this study is to determine prevalence and predictors of HSV 2 infection in Durban, South Africa by using available data that has not been previously analysed for the purpose of adding scientific evidence to the existing body of knowledge relating to HSV 2.

Method: The study involves secondary analyses of data collected as a prospective study which enrolled women who participated in a clinical trial. A total of 3472 sexually active women were screened in the primary study from two clinics in Durban. All consenting participants were tested for HIV, HSV 2, *Trichomonas vaginalis* (TV), *Neisseria gonorrhoea* (NG) and *Chlamydia trachomatis* (CT) infection.

Results: There were 2532 women who had HSV 2 giving a prevalence of 73%. Of these, 53% also tested positive for HIV infection. In univariate analysis, co-infection with HIV was strongly associated with HSV2 (Odds Ratio (OR): 7.4, 95% Confidence Interval (CI): 6.0, 9.1, $p<0.001$). There was also an association between other STIs, such as CT, NG and syphilis and HSV 2, although only NG was significantly associated with prevalent of HSV 2 (OR: 2.3, 95% CI: 1.3, 4.1, $p=0.005$). Women older than 25 years of age more likely to have HSV 2 (OR: 2.4, 95% CI: 2.0,2.8, $p<0.001$). A risk of being infected with HSV 2 increased with the number of reported lifetime sexual partners Those with two and three or more were 2,5 and 4.6 times more likely to have HSV2 respectively (OR: 2.5, 95% CI: 2.1,3.1, $p<0.001$ and OR: 4.6, 95% CI: 3.8, 5.6,

p<0.001 respectively). Women who had less than high school education were also found to have higher risk for HSV 2.

Conclusion: The secondary analysis showed a high prevalence of HSV 2 infection and a strong association of HSV 2 and HIV. A significant association of HSV 2 was noted in women having more than two sex partners and lower high school education. Therefore, it is recommended that screening for HSV 2 among high risk populations be incorporated into the STI screening and treatment packages.

Key terms

Sero-prevalence, Herpes Simplex Virus Type 2, HSV 2, sexually transmitted infection, HIV, genital ulcer disease, epidemiology, sexual behaviour.

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Dedication

I dedicate this to:

My late father, Mr M Moodley who will always be remembered for his hardwork and perseverance.

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To my daughters Mikara and Keiyasha for their support and encouraging words and thoughtfulness.

To my late grandparents, Mr and Mrs M Moodley and
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Table of contents Page

STUDY BACKGROUND

CHAPTER 2

LITERATURE REVIEW

CHAPTER 3

RESEARCH METHODS

Table of contents Page

CHAPTER 4

DATA ANALYSIS AND DISCUSSION

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

List of tables

Page

List of figures

Page

List of abbreviations

AIDS	Acquired Immune Deficiency Syndrome
CRF	Case Report Forms
CT	Chlamydia Trachomatis
GUD	Genital Ulcer Disease
HSV 2	Herpes simplex Virus Type 2
HIV	Human Immunodeficiency Virus
MIRA	Methods for Improving Reproductive Health in Africa
MRC	Medical Research Council
NG	Neisseria Gonorrhea
PCR	Polymerase Chain Reaction
SA	South Africa
STI	Sexually Transmitted Infection
TV	Trichomonas Vaginalis
USA	United States of America

List of annexures

ANNEXURE 1 Ethics approval for the primary study (place in hard copy)

ANNEXURE 1 Ethical Clearance Certificate from the University of South Africa (place in hard copy)

CHAPTER 1

STUDY BACKGROUND

1.1 INTRODUCTION

Herpes Simplex Virus Type 2 (HSV 2) infection has been found to be more common in sub-Saharan Africa than in Europe or North America. Up to 82% of women and 53% of men in sub-Saharan Africa were seropositive for Herpes Simplex 2 (HSV 2), the highest prevalence of HSV 2 infection in the world (Looker, Garnette & Schmid 2008:805). HSV 2 is a sexually transmitted infection (STI) and the most common cause of genital herpes. In all populations studied HSV 2 infection is more common in women than in men as noted inastudy conducted at the University of Washington, International Clinical Research Centre in 2009, assessing suppression as a potential tool to prevent HIV transmission. This was a national study conducted in United States of America (USA) which also showed that one of five sexually active adults are infected with HSV 2. In Southern Africa about 50% to 70% of Human Immunodeficiency Virus (HIV) negative women have an HSV 2 infection (Karim, Karim, Frohlich & Grobler 2010:5996).

The sub-Saharan region remains one of the areas hardest hit by Human Immunodeficiency Virus (HIV) and Acquired Immune Deficiency Syndrome (AIDS) epidemic. It is estimated that 22.5 million of people living with HIV globally and women in particular bear the greatest burden of the disease (UNAIDS 2008). South Africa has a much higher HIV prevalence than in the rest of the sub-Saharan region − 19% as compared to 6.1% in other regions. The HIV epidemic is fuelled partly by sexually transmitted infections as cited in the HIV/AIDS Policy fact Sheet (2011). Curable STIs play a greater role in HIV transmission and incurable STIs such as HSV 2 have a large impact on HIV acquisition. HSV 2 has emerged as the most prevalent STI pathogen and the most common cause of genital ulcer disease (GUD) worldwide (Weiss 2004:24a-35b). The sub-Saharan region remains one of the areas hardest hit by HIV which is spread mainly by heterosexualtransmission (UNAIDS 2008). A study by Chen, Ballard and Beck (2000:21-29) showed 50% of men attending sexually transmitted disease clinics were infected with HSV 2.

HSV 2 is transmitted sexually primarily from partners with asymptomatic or unrecognised infection. The presence of genital ulcers increases the risk both of acquisition and transmission of HIV.Randomised controlled clinical trials of herpes suppressive therapy on people living with HIV have shown that HIV alters the clinical presentation of HSV 2 infection in co-infected persons with low CD4 counts. This resulted in slow healing of the herpes ulcer leading to high levels of HIV and HSV 2 genital shedding according to Delany, Clayton and Mlaba (2007). HSV 2 infection is an important public health concern because of the morbidity associated with symptomatic infections as well as the frequency of recurrence of this disease and its strong association with HIV acquisition.

Primary prevention of the spread of HSV 2 infection is a vital strategy to reduce the increased risk of STI and HIV infection that is associated with HSV 2. Making aware of high HSV 2 prevalence in South Africa and the association with HIV infection and other STIs are important steps in addressing the increased risk for HIV infection.

1.2 PROBLEM STATEMENT

HSV 2 is the most common cause of genital ulcer disease and HSV 2 prevalence in sub-Saharan Africa ranges from 27% to 57% in men to 30 to 74% in women (Looker et al 2008:805). The HSV 2 prevalence among commercial sex workers in Durban, South Africa in 2005 was 84%. Also in a study conducted by Ramjee, Willam, Van Dyk, De Deken and Karim (2005:333-339) in Durban, showed that 50% of the women recruited were living with HIV while 84 % were HSV 2 infected .

Most persons who transmit genital herpes sexually have asymptomatic shedding and unrecognised lesions. Sexually transmitted infections especially HSV 2 is among the most well established risk factors for HIV infection. While it has been shown that HSV 2 is a risk factor for HIV 1, few studies have been conducted to investigate the relationship between HIV1 other STIs and HSV 2 seroconversion. Therefore analysing this data will shed light on the risk factors posed in accquiring HSV 2.

1.3 RATIONALE AND HYPOTHESIS FOR THE STUDY

Most persons who transmit genital herpes to a sex partner do not have a history of lesions at the time of transmission of the infection, suggesting that asymptomatic shedding and unrecognised lesions are responsible for most causes of transmission. While it has been shown that HSV 2 is a risk factor for HIV and other STIs few studies have been conducted in South Africa to determine prevalence of HSV 2, and its association with HIV1andother the associated risk factors. In research conducted on HSV 2. It is noted that an epidemiological synergy exists between sexually transmitted diseases including HSV 2 and HIV 1 and thus the control of one may have beneficial effects on the control of the other. Epidemiological studies on HSV 2 have consistently identified correlates of the disease. These risk factors can be categorised as socio-demographic factors such as age, gender, education, socio-economic status and behavioural factors, such as number of sexual partners, type of relationship, sexual frequency and condom usage. However, there is limited data that is available about the South African population with regards to HSV 2 associated risk factors. Available data has mainly incident rates of HSV 2 and which are mostly older than 10 years.

1.4 PURPOSE OF THE STUDY

The purpose of this study is to analyse data to determine the prevalence and predictors of HSV 2 infection in Durban, South Africa, and to ascertain the risk caused by HSV 2.

1.5 SIGNIFICANCE OF THE STUDY

Firstly, the vast majorities of HSV 2 infections in adults are relatively asymptomatic in their clinical manifestations but yet increases the risk of acquiring other sexually transmitted infections. Therefore early identification is essential to manage this infection effectively. The high prevalence of HSV 2 globally indicates the need for adults and health care workers to be aware of the high prevalence of HSV 2 in order to better recognise symptoms, appropriately treat them to prevent transmission.

Secondly, primary prevention of HSV 2 infection might be an important strategy to reduce the risk for HIV infection and other STIs associated with HSV 2. Showing the link between HSV 2 and associated risk factors are important first steps in addressing the epidemic.

Thirdly, the findings of this study should contribute significantly to the existing knowledge on the association of HSV 2 and HIV including the association with other STIs. Moreover the findings should assist and encourage a review of current health policies to adopt serological screening for HSV 2 among high risk populations when screening for other STIs.

Fourthly, the findings of the study would have public health implications if a high prevalence of HSV 2 in the South African population is noted hence recommending research into development of an HSV 2 vaccine should continue. A HSV 2 vaccine is more likely to result in a more effective preventive measure in the future.

Lastly, information from this study will add to the body of knowledge in the need to address high burden of co-occurring STI in people to prevent HIV transmission in a country which has one of the highest levels of HIV transmission.

1.6 OBJECTIVES OF THE STUDY

The objectives of this study are to determine:

- the prevalence of HSV 2 in a cohort of women in the Durban area
- association between HSV 2 in a cohort of woman in Durban area whose HSV 2 status is unknown and who are at risk of acquiring HIV, Neisseria Gonorrhoea, Chlamydia Trachomatis and Trachomonis Vaginalis
- HSV 2 acquisition with relationship to sexual behaviour patterns, demographic characteristics and socio-economic status

NB: The primary study measured incident rate of HSV 2, HIV and other STIs through use of diaphgram as an investigational product. Therefore the above objectives are not replicated by the researcher in this study.

1.7 DEFINITIONS OF KEY CONCEPTS

Sero prevalence is the number of persons in a population who test positive for a specific disease based on serology (blood serum) specimens.

Herpes Simplex Virus Type 2 (HSV 2) is a sexually transmitted disease (STD) caused by the herpes simplex viruses type 1 (HSV) or type 2 (HSV 2). Most genital herpes is caused by HSV 2.

Sexually transmitted infection are illnesses that has a significant probability of transmission between humans by means of human sexual behaviour, including vaginal intercourse, oral sex, and anal sex.

Human Immunodeficiency Virus is the virus that causes AIDS, a debilitating and deadly disease of the human immune system.

Neisseria gonorrhoea are found within pus cells of the urethral and vaginal discharge.

Chlamydia trachomatis. Gram negative bacteria that are parasites in humans which cause disease.

Trachomonis vaginalis causes inflammation of the vagina associated with itching and increased vaginal discharge.

Genital Ulcer disease. Ulcerativelesions on the genitals, usually caused by a sexually transmitted condition such as herpes, syphilis or chancroid. The presence of genital ulcers may increase the risk of transmitting HIV.

Epidemiology: is the study of health-events, health-characteristics or health-determinant patterns in a population.

Socio-demographics refers to different groups of people within the society. In order to investigate socio-demographic variables focus is on age, gender, ethnicity, and socio-economic status.

Sexual behaviour. Human sexual behaviour refers to the manner in which humans experience and express their sexuality.

Cohort of woman. A group of woman with a shared feature.

For this study the cohort of woman will refer to woman who meet the eligibilty criteria set out in the primary study.

(Concise Oxford Medical Dictionary 2007).

1.8 RESEARCH DESIGN AND METHODOLOGY

For this study an analytic, non-experimental design is appropriate to measure objectively the variables namely age, sex, educational level, marital status, condom use and coital frequency and statistically analyse and interpret the data.

The study involved secondary analyses of data collected as a prospective study which enrolled women who participated in a clinical trial from November 2003 to November 2006. The aim of this study is to determine prevalence and predictors of HSV 2 infection among women in Durban.

A quantitative approach has been chosen for this study because quantitative research emphasises quantification and measurement of properties. The rationale is to measure the research variables associated with HSV 2. The study is non experimental as it will make use of existing data to quantify, describe and explore the existing phenomenon, that is, assessing prevalence of HSV 2 and noting the relationships between the disease and identified variables.

1.9 SAMPLING

This study will entail secondary data analysis whereby data has been collected but not yet analysed, thus sampling was determined by the primary study protocol and information provided on sampling here will be related to the primary study as only a subset of data will be extracted to meet the objectives of this study.

The participants are women who have consented to participate in the 'Methods for Improving Reproductive Health in Africa' (MIRA) study. To be eligible for participation a woman had to fulfill a few criteria. The woman who had been HIV negative at the screening phase was one of the main eligibility criteria. Other eligibility criteria will be further noted in the methodology chapter.

1.10 DATA COLLECTION

Case report forms (CRF) was used to record all clinical and behavioural data and laboratory information obtained in the trial. Two types of laboratory testing was conducted i.e., on site testing was done for pregnancy and rapid HIV testing. Testing of samples was also done at local laboratories for Neisseria Gonorrhoea (NG), Chlamydia Trachomatis (CT) and Trachomonis Vaginalis (TV) and HSV 2. The total sample size was 3472 women who were recruited from November 2003 over two years and the study was completed in November 2006.

NB: Due to this study being secondary analysis of data sampling, data collection will be further explained in the context of the primary study in chapter 3.

1.11 DATA ANALYSIS

Data will be analysed by a statistician using the Statistical Package for Social Science, (SPSS) IBM, Version 19.0.

The statistical tests to be used for outcome measure will be:

- Univariate and multivariate logistic regression methods to determine the predictors of HSV 2. This will be expressed by means of frequencies and percentages.
- Cox Proportional Regression model will be used to determine the impact of HSV 2 positivity.

1.12 ETHICAL CONSIDERATIONS

Ethics deal with matters of right and wrong. This implies that anyone involved in social scientific research should be aware of agreements shared by researchers and participants about what is proper and improper in the conduct of research (Babbie & Mouton 2002:470).

In this study all rights of the participants, Medical Research Council of SA and funders were observed and respected.

This study does not require participant consenting as written consent was obtained from all participants in the primary study. Howeve,r ethical consideration is discussed in the context of the primary study as the researcher identifies this as an important aspect in the research process.

The ethical considerations included respect for the participants, privacy, autonomy, volunteerism, confidentiality and avoidance of harm. The ethical consideration will further be explained in chapter 3.

1.13 LIMITATIONS OF THE STUDY

The study is restricted to certain areas of South Africa and the data is based on women participating in clinical trials, thus limiting generalisability of HSV 2 infection rates to the general population and area of South Africa. This study deals with secondary analyses of data, hence a further limitation. Data maybe out of date since it was collected from 2003 to 2006. However, this is valuable data for analysis as not many studies on HSV 2 prevalence and associated risk factors are available regarding the South African population.

1.14 CONCLUSION

The control of HSV 2 is an important part of HIV and STI prevention strategy. The optimal strategy to achieve this is still being researched. Various studies conducted have concluded that HSV 2 is an important public health concern because of the morbidity associated with the infection, the strong association between HSV 2 and HIV

infection and other STIs. The aim of this study is to determine the prevalence and predictors of HSV 2. The outcome from this study will add to the body of knowledge that addresses high levels of co-occurring STIs in people to prevent HIV transmission.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

The literature review covers the key conceptswhich pertains to the topic. Key search words used to conduct a literature search on the electronic data base was HSV 2 and HIV prevalence, STIs, factors associated with HSV 2 and all other available information relating to the researchers understanding of the topic. The scope of the literature was broad enough to allow the researcher to become familiar with the research problem.(Burns & Grove 2007 b:136). In this chapter the researcher intends to show the phenomenon and relevancy of the topic through theoretical and empirical literature review. The topic under discussion will include HSV 2 sero prevalence, history of Genital Herpes Type 2, diagnosis of HSV infection, sexually transmitted co-infections, other risk factors associated with HSV 2 and intervention options.

2.2 HSV SERO PREVALENCE

HSV 2 is one of the most common sexually transmitted infections worldwide. The prevalence of HSV 2 is higher in developing countries than the developed countries (Weiss 2004:24a-35a). HSV 2 prevalence in sub Saharan Africa ranges from 27%−57 % in men and 30%−74% in women (Looker et al 2008:805).

According to Ramjee et al (2005:333-339), the HSV 2 prevalence rate among commercial sex workers in Durban, South Africa was 84%. This study further showed 50% of the women were HIV 1 positive while 84% were HSV 2 positive indicating that the two infections were strongly associated. A population based study conducted among youth in Carletonville, South Africa, reported HSV 2 prevalence rate of 53.3% in females and 17 % among males and around 89% and 40% for females and males aged 22−24 years (Auvert, Ballard, Campbell, Carael, Carton & Fehler (2001:885). In a meta-analysis on the incidence and risk factors of HSV 2 infection, data showed that HSV 2 incidence varied considerably across different countries, regions, and or populations. Africa and the United States were highly affected by HSV 2 and females were at higher risk of acquiring HSV 2 infection.

2.3 HISTORY OF GENITAL HERPES TYPE 2

Herpes Simplex is divided into two types namely HSV type 1 and HSV type 2. HSV 1 primarily causes infections in the mouth, throat, face, eyes and central nervous system. HSV 2 causes anal genital infections. The virus is a linear, double stranded DNA virus whose host are humans. Following a primary infection the virus enters the nerves at the site of primary infection, migrates to the cell body of the neuron and becomes latent in the ganglion. Herpes Simplex Virus is transmitted via close contact with infected bodily fluids such as salvia, genital fluids or fluids from active lesions as noted in Lafferty (2002:51-55). Herpes transmission occurs between discordant partners i.e. a person with a history of infection (HSV sero positive) can pass the virus to an HSV sero negative person. The only way to contact Herpes Simplex Type 2 is through direct skin to skin contact with an infected individual. HSV 2 asymptomatic shedding occurs at some time in most individuals infected with herpes. Asymptomatic shedding is more frequent within the first 12 months of acquiring HSV 2.The clinical manifestation of genital Herpes does not necessarily follow the described typical presentation of a prodromal illness that precedes the development of vesicles and ulcers. Laboratory testing is often used to confirm a diagnosis of genital Herpes.Not all cases of newly acquired HSV 2 infection presents with clinically apparent lesion http://en.wikipedia.org/wiki (accessed June 2011).

2.4 DIAGNOSIS OF HSV INFECTION

Clinical manifestation of patients with mucocutaneous disease is not always easily recognisable and in most cases may require laboratory testing. Viral culture is widely available and has been the gold standard for the diagnosis of HSV infection in patients with genital ulcers. Viral culture is highly sensitive for differentiating between HSV 1 and HSV 2. Isolation of the virus is easier in the vesicular or early ulcerative stages but sensitivity declines rapidly as the lesion begins to heal. Polymerase chain reaction testing for HSV DNA has greater sensitivity and relative affordability when compared to HSV culture. In Strick and Wald (2006:17) it is further noted that it has a sensitivity of greater than 95% compared with 75% for culture. However, the limitation for both tests is that they only focus on those with lesions. Type-specific serologic tests based

glycoprotein G antibodies are the tests of choice to establish HSV infection when no lesions are present, but are still inaccessible in developing countries due to high costs. The challenges to serologic testing are that the test does not indicate when the infection was acquired, nor does it confirm the diagnosis of a lesion. The other limitation is performing both the HSV PCR and the serology test for routine management of patients with genital herpes infection in resource poor countries is costly and technical skill is required (Strick & Wald 2006:26-28).

2.6 SEXUALLY TRANSMITTED CO-INFECTIONS

Sexually transmitted infections (STIs) are among the most well established risk factors for HIV infection. STI facilitates HIV transmission by invasion of the protective mucosal barriers and allows susceptible immune cells, which are CD4 T-helper cells, microphages to the sites of infection as postulated in Ward,Ronn(2010:305). Ulcerative and non-ulcerative STI creates portals of entry for HIV to access susceptible cells. People who are infected with HSV 2 are more likely to acquire and transmit HIV. This may be related to the inflammation of the genital mucus membranes and genital ulcers caused by HSV 2 which may provide a path for the entry and exit of HIV. The association between ulcerative STI and HIV transmission is well established, with as many as half of newly HIV infected people demonstrating HSV 2 infection as noted in Royce, Senq, Cates, (1997:190).

Recent research by Seth, Pellowski and Turne (2011:183), examined STI in people already infected with HIV and concluded that the effects of HIV infection on immunity can increase susceptibility to other STIs as individuals who are immune compromised are less able to have a protective response against sexually transmitted pathogens. For example HIV and HSV 2 co-infections are prevalent and both infections can facilitate acquisition of the other. A study conducted by Tobian, Serwadda, Quinn, (2005:733), illustrate the reciprocal relationship between HIV and HSV 2; 6396 men in Uganda were followed for 2 years and found a 1.09% of HIV seroconversion rate in the cohort. However HIV seroconversion was closely associated with HSV 2 seroconversion, more than half (56%) of HIV and HSV 2 infection occurred in the same time frame. In 25% of cases, HIV infection preceded HSV 2 infection and in 19 % of cases HSV 2 infection preceded HIV transmission (Tobian et al 2005:735). Viral STI and genital ulcer diseases, particularly HSV 2 are also linked to increased concentrations of HIV in blood

plasma and genital fluids. Various STIs differ in their impact on HIV shedding and acquisition. Overall, the greater the inflammatory response the greater the impact on HIV infectiousness is noted in Buchacz, Patel, Taylor (2004:275).Gonorrhoea and Chlamydia for example are associated with high concentrations of leucocytes in the genital tract and therefore greater HIV shedding. It is noted that STIs with greatest impact on HIV shedding are those that produce genital ulcers, urethral/vaginal discharge, specifically Chancroid, Gonorrhoea, Chlamydia, HSV 2, Trichomoniasis and Bacterial Vaginosis. HSV 2 is the leading cause of GUD in the developing countries and is especially prevalent among men who have sex with men (Seth, Pellowski & Turne 2011:183).

2.6 RISK FACTORS FOR HSV 2 INFECTION

Epidemiologic studies in other countries have consistently identified correlates of HSV 2 that can be mainly attributed to frequent sexual activity and cumulative exposure as noted in a study conducted by Weiss (2004). These risk factors can be categorised as socio-demographic, that is, older age, female gender, low education status, socio-economic status, behaviooral (number of sexual partners type of relationship, sexual frequency and condom use).

2.7 SOCIO-DEMOGRAPHIC FACTORS

HSV 2 is more common in sub-Saharan Africa than in Europe or North America. Up to 82% of women and 53% of men in sub-Saharan Africa are HSV 2 seropositive. These are the highest levels of HSV infection in the world, although exact levels vary from country to country. High HSV 2 sero prevalence has been observed for women in other African states such as Uganda and Zambia and in men mainly in Ethiopia (Weiss 2004:24a-35a).

Wiess (2004:24a-35a) further postulated that genital herpes appears less common in Northern Africa compared to sub-Saharan Africa. For example, only 26% of middle aged women have antibodies for HSV 2 in Morocco. Women are more likely to be infected with HSV 2 once they are over the age of 40 years. Children in Egypt are often infected with HSV 2 from a young age. HSV 2 or HIV 1 antibodies are present in an

estimated 54% of children under the age of 5 years and 77% in children over 10 years of age.

In general HSV 2 has been consistently found to be higher in women than in men. The possible reason for this difference can be explained by biological factors such as large surface area of the female genital mucosa which would increase the risk of acquisition and the general tendency for young women to choose sexual partners who are older than them.

A number of population based prevalence studies of age related trends in HSV 2 have been conducted. In the US HSV 2 prevalence increased until approximately age 30 and then stabilised. In Australia, prevalence similarly peaked at midlife and then plateaued. In Ontario, Canada, HSV 2 prevalence did not stabilise but rather continued to increase through the oldest group studied, 40−44 years, a pattern suggesting additional men infection among middle aged adults. Countries such as Costa Rica and Switzerland have observed the highest prevalence among the most elderly men. In Switzerland elderly men believed to represent the war cohort. However, it is likely that an increase in prevalence with age also represents new infections occurring at older age, as postulated by Greta, Nooshin, Todd & Coleman (2010:10).

Greta et al (2010:10) further noted in a survey conducted on the United States population from 1999–2008 by the United States National Health and Nutrition Examination Survey, results showed that those who were single or not married had a higher HSV 2 prevalence than those who were married or cohabitating. Among unmarried, 45–49 years old, seroprevalence was 55.3% in women and 25.7% in men. Relationship status remained an independent predictor of HSV 2 when controlling for age, race and sex among those age 30–49 years, married or cohabitating status was protective for HSV 2 in this groups(odd ratio=0.69

2.8 BEHAVIOURAL FACTORS

Studies have indicated an association between HSV 2 and a few numbers of sexual partners. This can likely be due to age of sexual debut, condom use and early detection and treatment of STIs. The early age of sexual debut is a marker of longer period of sexual engagement hence exposure to HSV 2. In a socio-demographic study in Hall

(SA Journal of Aids 2005) showed the correlates of Herpes Simplex Type 1 and 2, and concluded that age, sex, race and level of education independently predicted outcome of HSV subtypes. In a study conducted by Wald, Langenberg and Krantz (2005) showed that condoms if used correctly are the most effective method in preventing STIs. Consistent and correct condom use was found to be protective in susceptible women in HSV 2 sero incident studies. A sero incident study among monogamous heterosexual couples on suppressive antiviral therapy showed a beneficial effect of condom use (Corey, Wald, Patel, Saeka, Tyring, Warren.2004:350). In this study the couples who used condoms for more than 90% of sex acts showed lower HSV 2 transmission rates. Condoms offer moderate protection against HSV 2 in both men and women, with consistent condom users having a 30 % lower risk of HSV 2 acquisition compared to those who never use condoms.

2.9 INTERVENTION OPTIONS

2.9.1 Primary prevention

HSV 2 infection is an important public health concern because of the morbidity associated with the infection. Thus primary prevention of HSV 2 should be a key strategy of reducing the HSV 2 incidence since most asymptomatic individuals are unaware of their infection and they are considered at high risk for spreading infection.

2.9.1.1 Behavioural counselling and barrier methods

Behavioural counseling should be aimed at identifying risky behaviour patterns, given that HSV 2 is a marker of sexual activity, educational interventions should target young persons especially women and promote behavioural changes. Risk reduction messages should include delaying sexual initiation, condom use, reducing concurrent partnerships, knowing one's partner HSV 2 status and promotion of health seeking behaviour and identifying STI symptoms. Condoms offer moderate protection against HSV in both men and women. With consistent condom use, users have a 30% lower risk of HSV 2 acquisition compared with those who never use condoms in Wald et al (2005). The virus cannot pass through a latex condom, however a condom's effectiveness is limited because it does not prevent skin contact or bodily fluid contact with other unprotected areas. The use of condoms or dental dams also limits the transmission of Herpes from

the genitals of one partner to the mouth of the other or vice versa (Gupta, Warren & Wald 2008:2127).

2.9.1.2 Vaccine and microbicides

A vaccine for HSV 2 prevention would be a primary method of choice to reduce the acquisition of genital Herpes. Currently there is no available vaccine in preventing HSV 2. Vaccine for HSV 2 is currently undergoing clinical trials. Once developed they may be used to help with prevention or minimise initial infections as well as treatment for existing infections (Stanberry, Spruance, Cunningham, Bernstien, Minder, Sacks. 2002:1652).

Microbicide gels which prevent STIs in vitro are another option that would ideally offer women protection againsts STIs. The broader use of microbicide gel could reduce the incidence and prevalence of HSV 2, especially among the vulnerable populations.The gel would also be a unique tool for the prevention of HSV 2 by women who are not able to insist on a mutually faithful relationship or condom use with their male partners (Karim et al 2010:1168). These products are however still undergoing research on human participants currently.

2.10 SECONDARY PREVENTION

Currently there is no method to eradicate herpes virus from the body, but anti viral therapy is available for the treatment of genital herpes. Medication can reduce the frequency, duration and severity of outbreaks (Blower, Wald, Gershengorn, Wang & Corey 2004:1610). This study further notes thattherapy is effective when given at the onset of clinical symptom manifestation or prodromal phase. Long term suppressive therapy reduces clinical re occurrences by 70% to 80% in persons with frequent outbreaks, that is, 6 or more times per year, and by up to 90% in clinical and subclinical shedding of HSV 2. According to Blower et al (2004), suppressive therapy is likely to be more beneficial than episodic treatment because it reduces both the symptomatic and asymptomatic infection episodes of HSV infection. In this study it is suggested to identify and treat persons with increased frequency of HSV 2 reactivation and identification of high risk groups with newly acquired HSV infection such as sexually active young adults and individuals co-infected with HSV 2 and HIV infection.

2.11 CONCLUSION

HSV 2 is noted to be one of the most common sexually transmitted infections globally. Studies in sub-Saharan Africa showed that approximately 50% of people who are HIV uninfected have HSV 2 infection and between 60−90% of people who are HIV infected have HSV 2 infection. Further HSV 2 seems to be more common in women than in men. Data from multiple studies indicate that HSV 2 appears to be a major factor in fuelling the HIV epidemic.

Data also show HSV 2 incidence varied among countries, regions and populations and is related to a number of sexual and demographic risk factors which calls for specific control strategies. However, the possible availability of an HSV 2 vaccine that is able to protect over 70% of women offers the best hope for control of genital herpes. Further,there is a need to enhance primary strategies which would be a key to reducing incident rate of HSV 2 infection.

CHAPTER 3

RESEARCH METHODS

3.1 INTRODUCTION

Research methodology entails a description of the study design, along with an explanation of how the population is selected and the criteria used for selection, a description of how data is collected as well as ethical issues are discussed.

3.2 STUDY DESIGN

This is secondary analysis .The primary study included clear and organised activities with specific purpose to meet the specified objectives in the study. The process of research involves observation and analysis, planning is imperative in order to put in place what will be observed and analysed as dictated by the plan.

For this study the researcher selected a quantitative design to measure objectively the variables involved and to statistically analyse and interpret the data.

3.2.1 Quantitative research

Literature describes quantitative research as descriptive and explorative with real life connotations that provide characteristics of the phenomenon to be studied. A quantitative approach has been chosen for this study because quantitative research emphasises quantification and measurement of properties. The rationale is to measure the research variables associated with HSV 2 to determine sero prevalence and incidence rates.

The study is non-experimental, it makes use of existing quantitative data to describe and explore the existing phenomenon,which is, assessing prevalence of HSV 2 and noting the relationship between the disease and identified variables.
The data used in this study forms part of data collected in the primary study. This data meets the objectives of this study and is available for analyses as it was not used to

evaluate the end points and objectives of the primary study. Therefore a subset of data will be abstracted to answer the research questions in this study. This data will be used to statistically analyse and interpret the outcomes in relation to the objectives set out. It is because variables are measured in this study quantitative research is the most suitable paradigm here.Non-experimental research design investigates situations and relationships in variables without manipulation of the independent variables (Polit & Beck 2008:763).

3.4.2 Descriptive research

Burns and Grove (2007:74) postulate that descriptive research aims at describing and exploring a phenomenon in real life situations, which include characteristics of a particular group of people or situations. The expectation is to give an overview of what exists and state the frequency of the occurrence of the events.

3.4.3 Explorative research

Babbie and Mouton (2002:80) describe explorative research as a quantitative study which enables researchers to discover new situations that can be described comprehensively to bring out clarity and meaning related to the phenomenon under study.The selection of the research design was based on the study objectives.In this study HSV 2, HIV and STIs are identified to be the dependentvariables.Demographic characteristics, risky sexual behaviour and age are independent variables.

Data relating to the dependent and independent variable will be extracted from available data that was collected as part of a clinical trial, which will be referred to as ‘primary study’, which was conducted in Durban, South Africa. This data has critical information that meets the objectives of this study and therefore will to be analysed and shared as scientific evidence.

This data is available for analyses as it was not used to evaluate the end points and objectives of the primary study. A subset of data will be abstracted to answer the research questions in this study.This data will be used to statistically analyse and interpret the outcomes in relation to the objectives set out.The data that was used in the

primary study was used to address a different research question and other objectives that have no relation to this study.

Ethical approval in accordance with the guideline on human experimentation was obtained for the main study from the Biomedical Research Ethics Committee, University of KwaZulu-Natal, in Durban (see Annexure 1). The student sought permission from Medical Research Council/HIV Prevention Unit and the University of California, San Francisco, for use of data in this research project (see Annexure 2). Study no. NCT00121459

3.5 RESEARCH METHODS

3.3.1 Sampling

This study utilises secondary data collected as part of a prospective randomised, controlled trial. Data will be analysed from two South African sites located in Durban. There are limited prevalence data available on HSV 2 prevalence and associated risk factors in South Africa and global studies have shown a strong association of HIV and STI acquisition and HSV 2 positivity, therefore it is appropriate to use available data to show prevalence. Therefore this secondary analyses of data is not only cost effective and time saving but will add value to studies conducted globally on HSV 2 indicating an urgent need to recognise and prevent HSV 2 infection among high risk populations.

This study will entail secondary data analysis whereby data has been collected but not yet analysed, sampling was determined by the primary study protocol and information provided on sampling here will be related to the primary study.Although sampling was not done in the study,the researcher explains sampling to demonstrate understanding of the research process by the researcher.

Study sites recruited woman from general health clinics, through community-based organisations, through word of mouth in the community, by using posters and leaflets in strategic areas. Educational materials were used to convey the key aspect of the study to potential participants, such as study objectives, inclusion and exclusion criteria and all study procedures were shared with potential participants. They were also informed of laboratory testing and study risk and benefits.

3.5.2 Study population

Durban's surrounding areas were the base for two groups of women who together comprise one cohort which made up the research population. One is peri-urban, and the other area is rural are whereby participants were drawn in Durban. It is important to include rural women in the study for generalisability and reasons related to public health policies.

Durban is located along the Indian Ocean coast in the province of KwaZulu-Natal, the province in South Africa with the highest HIV incidence, 5.7 million in SA and 33% are in KZN (UNAIDS 2008). Between 1999 and 2000, HIV prevalence among women in their twenties in KwaZulu-Natal grew from 32.5% to 36.2% and incidence rates greater than 10% have been reported in certain areas(UNAIDS 2008).

3.5.3 Sample

Woman who met the eligibility criteria was randomly selected from the Durban area. To be eligible for participation, a woman must satisfy the following criteria:

- Age 18–49 years
- Be sexually active (coital frequency of at least four times per month on average)
- HIV negative
- Willing and able to give informed consent.
- Willing to provide blood sample for HIV, HSV 2 testing

Total sample size for screening in both the Durban sites was 3472 women which started in November 2003 and ended in November 2006. For this research project the sample of 3472 will be used to measure prevalence rate.

3.6 ETHICAL CONSIDERATION

Ethics basically refers to a system of moral principles suggested by a group or individuals. Ethics often go hand in hand with values, which deals with issues pertaining to what is right or wrong and good and desirable (Babbie & Mouton 2002:470). The following ethical aspect that was addressed in the primary study included:

3.4.1 Informed consent process

The informed consent process was conducted in the language of participant's choice which was either in English or Zulu. The consent form assured participants that their involvement in the interview was voluntary, that they had the right not to answer any questions that they wished not to answer or withdraw consent at any point of the research study and confidentiality was highlighted at all times.

3.4.2 Maintaining confidentiality

All study participants received a unique study identification number that was recorded on all paper forms. One electronic file linked participants name and study number was maintained by the study coordinator. This was done in order to maintain participant's confidentiality. All records and specimens were identified by study number. Completed study forms were kept in lockable cabinets at the study sites. All records that contained names or other personal identifiers were kept locked separately from records identified by study staff.

3.5 DATA COLLECTION

Although data will not be collected in this study the researcher outlines the data collection instruments used in the primary study as this would ensure validity in the data proposed for use in this research study.

Operational definitions with regards to data collection will be discussed with reference to the primary data collection whereby the researcher was directly involved in data collection.

Standard Operating Procedures (SOP) and good clinical practice were tools used to ensure reliability, consistency and accuracy in data collection. Professional nurses and

laboratory technicians were trained for data collection to ensure understanding and avoid errors and ambiguity and enhance standardisation.

The researcher of this study was directly involved in development and review of (SOP) and data collection including blood sample collection in the capacity of a professional nurse.

3.5.2 Methods and process: Clinical and diagnostic procedures

A written informed consent was obtained from all participants before commencement of study procedures. All procedures were performed by qualified, trained study staff. Diagnostic testing, answering an interviewer administered questionnaire known as case report form (CRF) demographics and sexual behaviour was performed. Participants received counseling before testing for HIV and other STIs. Urine specimens were collected for polymerase chain reaction (PCR) testing for Neisseria Gonorrhoea, Chlamydia Trachomatis and Trichomonas Vaginalis were done on site. HIV Rapid tests were performed on whole blood samples from finger pricks. Venous blood was collected by research nurse to be used to tests for HSV 2.

3.6 DATA ANALYSIS

Data was analysed by a statistician using the SPSS IBM, Version 19.0. The statistical tests to be used for outcome measure will be:

- Univariate and multivariate logistic regression methods to determine the predictors of HSV 2. This will be expressed by means of frequencies and percentages.
- Cox Proportional Regression model will be used to determine the impact of HSV 2 positivity.

3.7 INTERNAL AND EXTERNAL VALIDITY OF THE STUDY

Although the following relates to the primary study it is imperative to note that the integrity of the data proposed for use has been collected through a rigourous scientific process ensuring reliability and validity therefore the researcher outlines the following that was undertaken in the primary study.

3.7.1 Internal validity

A pilot test was established to ensure that language and reading level of the questionnaires were appropriate.

3.7.2 External validity

This was enhanced by selection of population sample from two different communities mainly rural and peri urban this was to ensure generalisabiltiy of the population.

3.8 LABORATORY PROCEDURES

Many onsite tests were conducted at the study clinics and others were conducted in local outsourced laboratories, therefore special attention was paid to standardisation and quality control in both sites. All on site, local laboratory technicians were trained ensuring a consistent standard of quality. The local laboratory had to adhere to standards of good laboratory practice, had quality control procedures in place and ensured documentation of procedures that was performed. Internal controls provided by the manufacturers of automated tests and test kits were performed to ensure validity of test kits used.

External monitors reviewed all laboratory source documents and laboratory result form, standard operating procedures for all tests performed as part of the study protocol, this included review of results to verify consistency. Special emphasis was placed on minimising transcription errors of test results by repeated quality checks performed by laboratory technicians.

3.9 DATA PROCEDURES AND MANAGEMENT

At each visit all CRFs are checked at site for accuracy and completeness. Information collected on study forms was checked by staff completing the forms, study coordinator and by monitors. This was done to detect errors, omissions and discrepant responses to questionnaires. In addition standard quality control procedures were established prior to data capturing to ensure the integrity of the data. CRF data was processed and reviewed using Datafax version 3.7 (clinical DataFax System Inc.). Original CRFs was compared against the database to verify the accuracy of the data.

3.10 CONCLUSION

Although this study entails secondary analysis of data this chapter describes the research design and methods used to collect data including the population sample, research instrument and ethical consideration specific to the primary study. By giving this information the researcher is able to demonstrate knowledge of the research process. In this study HSV 2, HIV and STIs are identified to be the dependent variables and demographic characteristics, risky sexual behaviour and age independent variables, which will be determinants of HSV 2.

CHAPTER 4

DATA ANALYSIS AND DISCUSSION

4.1 INTRODUCTION

According to McMillan and Schumacher (1993), the aim of analysing and interpreting research data is to test and achieve research objectives and provide answers to research objectives and to the research questions. In this study the researcher analysed and interpreted data from CRF and laboratory test results. For clarity and meaningful presentation of the study, bar graphs and pie charts were used. A discussion follows for comparison of the findings as guided by the relevant objectives. Therefore data analysis and research results will be discussed in this chapter.

4.2 DATA ANALYSIS

Statistical software ,IBM SPSS version 19.0 was used to generate prevalence estimates and 95% confidence intervals. Prevalence was analysed by age group, education level, number of lifetime sex partners, marital status, condom use and other STIs.

Demographic information including age, educational level, number of sexual partners and marital status and condom use was obtained through administration of case reports forms and all analysis was stratified as mentioned above with specific prevalence for HSV 2 positivity along with corresponding 95% confidence intervals.

4.3 RESEARCH RESULTS

4.3.1 HSV 2 prevalence and age

In the population (N=3472) under study, 2532 women were HSV 2 sero positive a seroprevalence of 73% (95% CI).

Older age was significantly associated with HSV 2 sero positivity.Whencompared to those younger than 25 years of age, older women were more likely to be diagnosed with HSV 2 (OR:2.37, 95% CI:2.00,2.81, p=,0001 and OR: 3.18, 95% CI: 2.55,3.95, p=<.0001 for 25−34 years and 35 years respectively). In those younger than 25 years,34.7%(n=874) were sero positive between 25−34years 39.9%(n=1005) and less than 35 years 25.4% (n=639) were tested HSV 2 positive. This is in keeping with observations made in other studies conducted in African countries.

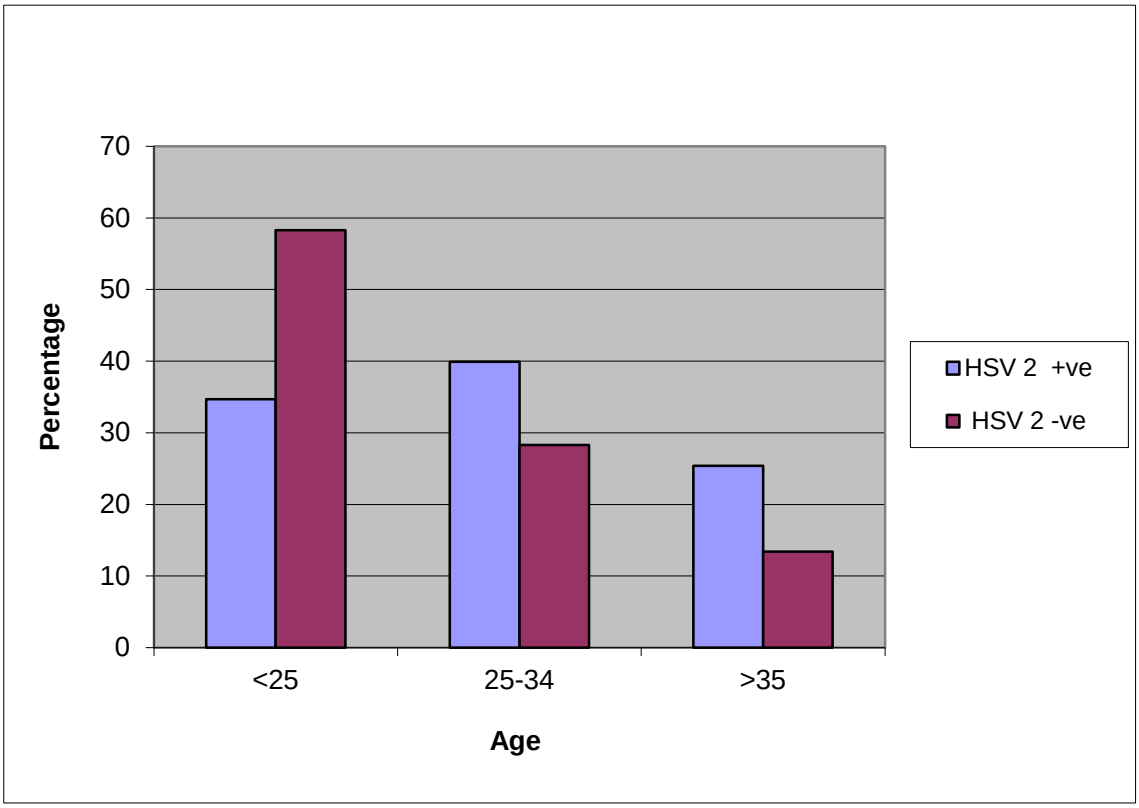

Figure 4.1 Prevalence of HSV 2 by age (N= 2532)

4.3.2 Educational level

For this analysis educational level was categorised as high school level or less than high school level. HSV 2 sero prevalence was higher among women obtaining lesser than high school education,76.9% (n=1949) when compared to those women who have obtained high school education 23.03% (n=583). Statistically significant correlation with p=<.0001 was noted between HSV 2 sero positivity and the level of education obtained. A low level of education may indicate lack of understanding in the cause of disease and illness and may further delay seeking treatment and intervention.

4.3.3 Relationship status

Relationship status was assessed using the two categories, single or never married and married or cohabitating. For this analysis those who never married, divorced or widowed were grouped together as single, representing a population most likely to be available for or initiating new sexual relationships. Those who were cohabitating were classified as married to represent those unlikely to be initiating new sexual relationships. Among single women the overall prevalence of HSV 2 was low 13.6%(n=345) when compared to married/cohabitating women 86.4% (n=2187).

4.3.4 Sexual partners and condom usage

Measures of sexual activity included having any sex in the past month and having two or more sex partners in the past year. Sex was defined as vaginal, anal, oral sex with a male partner.Woman who reported to having two or more sex partners 28.4% (n=714) were likely to be diagnosed with HSV 2 compared to those who reported only one lifetime sexual partner 17.6% (n=443) (OR: 2.53, 95% CI: 2.08, 3.07, p=<.0001) respectively. A significant association was noted in never using condoms and HSV 2 seroprevalence, 69.82% (n=1758) and women who reported always using condoms 44.4% (n=1118).

Table 4.1 Number of sex partners categorised by HSV 2 (N=3472)

Number of sex partners	**HSV 2 screening**		
Frequency	**0**	**1**	**Total**
One partners	43.4% (n=414)	17.6% (n=443)	**857**
Two partners	27.7% (n=264)	28.4% (n=714)	**978**
Three partners	15.0% (n=143)	23.4% (n=588)	**731**
Four partners	13.9% (n=133)	30.7% (n=773)	**906**
Total	**954**	**2518**	**3472**

Table 4.2 Baseline socio-demographic characteristic and sexual behaviour

HSV 2 POSITIVE			
	Yes	**No**	**P value**
Demographics			
Age (years) median (IQF)			
<25	34.7% (874)	58.3% (556)	<.0001
2–34	58.3% (1005)	28.3% (270)	<.0001
>35	25.4% (639)	13.4% (128)	<.0001
Education			
High school	23.0% (583)	33.47% (321)	<.0001
Less than high school	77.0 (1949)	66.53 (638)	<.0001
Behavioural			
Regular sex partners	86.10% (2168)	80.40% (767)	<.0001
Casual sex partners	0.20% (5)	99.8% (2513)	<.0001
Number of sexual partners			
One sex partner	17.6% (443)	43.40% (414)	<.0001
Two or more partners	28.36% (714)	27.7% (264)	<.0001
Marital status			
Single (never married)	13.6% (345)	19.19% (184)	<0.0001
Married/cohabitating	86.4% (2187)	80.1% (775)	<0.0001
Condom use			
Never	69.8% (1758)	71.28% (680)	
Always	44.4% (1118)	47.48% (453)	
Positive laboratory results			
Chlamydia Trachomatis	8.9% (227)	8.9% (84)	0.9440
Neisseria Gonorrhea	3.3% (83)	1.5% (14)	0.0042
Trachomonis Vaginalis	6.3% (160)	5.9% (57)	0.68
HIV	53% (1322)		<0.0001
HSV 2	73% (2532)		

In the above table there were 2532 women who had HSV 2 giving a prevalence of 73%. Of these, 53% also tested positive for HIV infection. Co-infection with HIV was strongly associated with HSV 2 with p<0.001). There was also an association between other STIs, such as CT, NG and syphilis and HSV 2, although only NG was significantly associated with prevalent of HSV 2 (p=0.005).Women older than 25 years of age more likely to have HSV 2 , p<0.001. A risk of being infected with HSV 2 increased with the number of reported lifetime sexual partners Those with two and three or more were 2,5 and 4.6 times more likely to have HSV 2 respectively, p<0.001 and p<0.001 respectively. Women who had less than high school education were also found to have higher risk for HSV 2.

4.3.5 HSV 2 prevalence and co-occurring STIs and HIV

The prevalence of HSV 2 was 73% (n=2532) of these 53 % were also tested positive for HIV infection. In univariate analysis co-infection with HIV was determined to be the most significant predictor for HSV 2 diagnosis, (OR: 7.38, 95 % CI, 6.01, 9.07 p=<0001). STIs such as CT, NG and TV was significantly associated with prevalence of HSV 2 (OR: 2.28, 95% CI: 1.29, 4.05 p=0.005).The prevalence of HSV 2 co-infective with STIs are as follows. HIV=53%, CT=3.3%, TV=6.3%, NG=3.3%

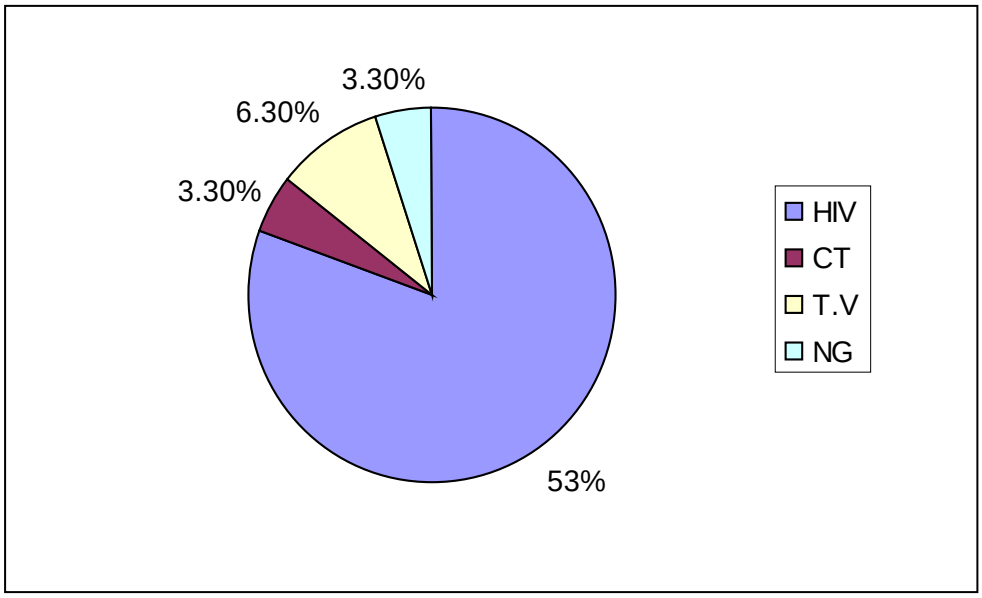

Figure 4.2 Prevalence of HSV 2 co-infection with STI

4.4 CONTRACEPTIVE USE

Three methods of contraception used in this study were injectable, oral pill and vasectomy, 4.1% (n=142) of women were on oral contraception, while 1287(37%) were on an injectable method and a few 5 (0.14%) reported partners having a vasectomy done. About 22.5% (n=780) reported no contraception use from a sample population of 3472. It is suggested that 36% (n=1258) of women used some other method of contraception other than those mentioned above. Of those women who reported no contraception use,17.4% (n=604) were HSV 2 positive.

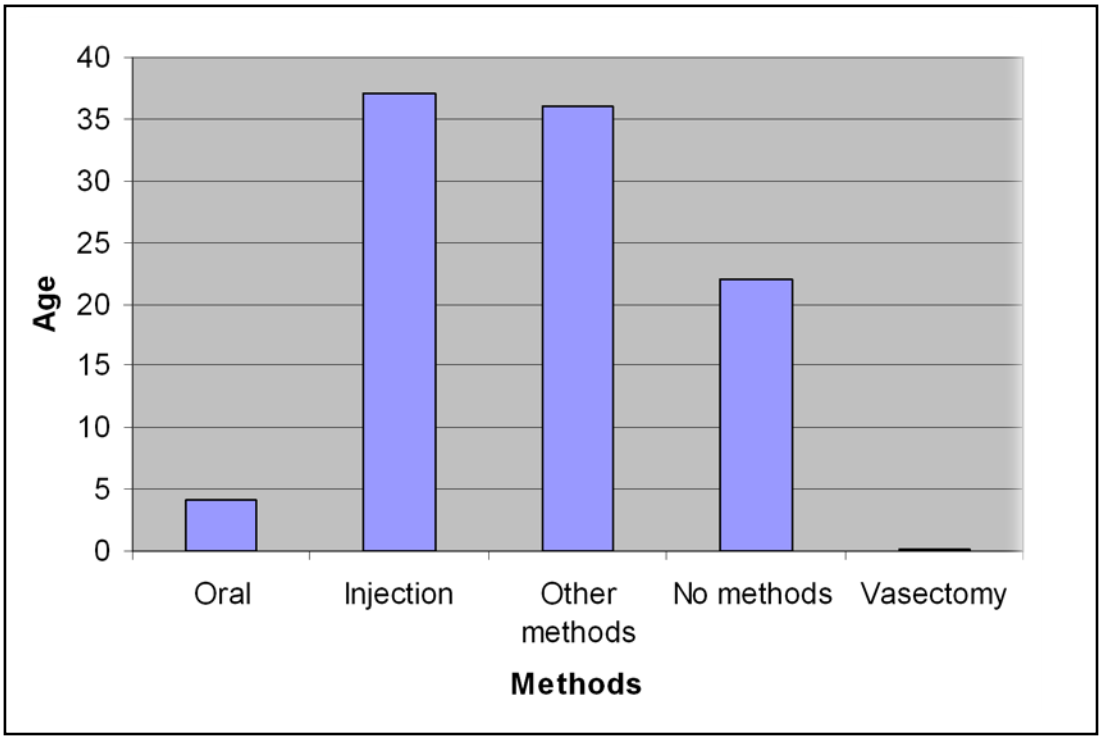

Figure 4.3 Percentage of contraceptive method usage

4.5 OVERVIEW OF RESEARCH FINDINGS

The prevalence of HSV 2 was 73% (n=2532) of these, 53% also tested positive for HIV infection. In univariate analysis, co-infection with HIV was determined to be the most significant predictor for HSV 2 diagnosis odds ratio (OR): 7.38 95%. Confidence Interval (CI): 6.01, 9.07, <0.001. STIs, such as CT, NG and syphilis, diagnosis with NG was significantly associated with prevalenceof HSV 2 (OR: 2.28, 95% CI: 1.29, 4.05, p=0.00). Compared to those <25 years of age, older women were more likely to be diagnosed with HSV 2 (OR: 2.37, 95% CI: 2.00,2.81, p<0.001 and OR: 3.18, 95% CI: 2.55,3.95, p<0.001) for 25−34 years and 35 or older years respectively. Also compared to women who reported only one lifetime sexual partner, those who had two, three or more were likely to be diagnosed with HSV 2 (OR: 2.53, 95% CI: 2.08, 3.07, p<0.001 and OR: 4.61, 95% CI: 3.83,5.55, p<0.001 respectively). Women who had less than high school education were determined to be in higher risk for HSV 2 seropositivity.

4.6 CONCLUSION

HSV 2 infection among women in particular is relatively high and confirms findings in other studies that sub-Saharan Africa has the highest HSV 2 sero prevalence in the world, at time reaching 80% in women by the age of 35 years.

In this sero prevalent study detection of HSV 2 antibody is positively associated with increasing age, lower levels of education, increased number of sexual partners and decreased condom usage. Coinfection with HIV was determined to be the most significant prediction for HSV 2 diagnosis.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1 INTRODUCTION

The aim of this study was to determine prevalence and predictors of HSV 2 infection in Durban, South Africa by using available data that has not been analysed previously, in view of adding scientific evidence to the existing body of knowledge relating to HSV2.This chapter further discusses overall study findings, conclusion and recommendations.

5.2 RESEARCH DESIGN AND METHOD

A quantitative approach has been chosen for this study because quantitative research emphasises quantification and measurement of properties. The rationale wasto measure the research variables associated with HSV 2 to determine sero prevalence and risk factors. The study wasnon experimental as it made use of existing data to quantify and explore the existing phenomenon, which was, assessing prevalence of HSV 2 and noting the relationships between the disease and identified variables.

This research study did not involve data collection as this study entailed secondary data analysis, therefore data that was collected was determined by the primary study protocol.

5.3 SUMMARY AND INTERPRETATION OF THE RESEARCH FINDINGS

5.3.1 HSV 2 positive

This study demonstrates high HSV 2 infections at 73% (n=2532) prevalence among women aged 18 to 49 years old. A study conducted by Ramjee et al (2005:333-339) in South Africa have also shown a significantly high HSV 2 prevalence in females. Infection with HSV 2 produces a diverse spectrum of diseases and more often than not this infection in adults is clinically asymptomatic but causes significant discomfort and

anxiety among millions of people. Genital HSV puts individuals at increased risk of acquiring other sexually transmitted infections including HIV.

5.3.2 HSV 2 and HIV co-occurring infection

The high prevalence of HSV 2 and HIV infection among the cohort of women in this study is in keeping with those reported from Africa and other regions, in high risk groups. The odds ratio for HIV and HSV 2 found here confirms (OR=7.38, p=0.001) results of other studies which have shown a strong association between HIV 1 and HSV 2. The strength of associations between HIV and HSV 2 and the high prevalence of HSV 2 in many developing countries may be important in explaining the very high rates of HIV in those settings. Epidemiological studies in Ward et al. (2010:305) and Buchacz et al (2004:275) support the hypothesis that HSV 2 increases the efficiency of HIV and STI acquisition and transmission. Similarly HIV may increase susceptibility to HSV 2, viral shedding and a low CD 4 count. It is further noted that HIV acquisition risk is highest among those with recent HSV 2 infection which may reflect the higher frequency and severity of herpetic ulcers in the early stages of HSV 2. It is not clear which infection comes first but HIV and HSV 2 persons experience severe frequent genital herpes syndromes and also have higher HSV 2 and HIV shedding from the genital tract. If anti-herpes treatment is not included in management of genital ulcer diseases, delayed ulcer healings result in prolonged HIV shedding and increase risk of HIV transmission. However, the decision about who would benefit from anti-herpes treatment and what screening tools used still pose a dilemma for policy makers. The high level of HIV and HSV 2 co-infection suggest that episodic and possibly long term suppressive therapy would be of benefit in the reduction time to healing of ulcers and HSV 2 and HIV shedding for those participants who have clinically HSV 2 symptoms if started early.

5.3.3 HSV 2 and STIs

Asymptomatic STIs are especially concerning as these infections worsen and if untreated does not alert the person to reduce risky sexual practices. If an individual presents with an STI, chances of having more than one STI are high due to risky sexual behaviour. In this study the prevalence of NG, CT, TV was significantly associated with HSV 2 infection.

The correlation between HSV 2 antibody and TV was more marked than that between HSV 2 and other laboratory confirmed STIs. In Machekano, Bassett, Zhou, (2000) postulated that the greatest prevalence of STI co-infections occur among individuals newly diagnosed with HIV. In this study people who tested HIV positive at the time of STI testing found an average STI prevalence of 19.6 %. In this study the prevalence of HSV 2 co-infective with STIs are as follows, HIV (53%), CT (3.3%), TV (6.3%), NG (3.3%). High rates of co-occurring STI will continue to impede efforts to prevent HIV transmission if efforts to prevent HIV transmission if primary prevention and treatment is not sort early. HSV 2 confers genital tract immunological changes which increase the risk of acquiring other STIs. Immnunological changes in the genital tract have demonstrated to enhance STIs. It is possible that control of HSV 2, would not only control the HIV infection but other STIs as well.

5.3.4 HSV 2 and socio demographic risk factors

The prevalence of HSV 2 infection occurs with some population bearing a greater burden of disease than others. Many observational prospective and retrospective studies have identified potential risk factors that influence HSV 2 transmission. Major factors associated with HSV 2 sero positivity includes female gender ,history of sexually transmitted infections, increasing numbers of sexual partners, low socio-economic status, level of education and age related risk factors.

In this study older age was significantly associated with HSV 2 sero positivity. This result is in keeping with other studies. HSV 2 prevalence increased with age peaking at the 25−35 age groups and leveling off after age greater than 35 years. For age lesser than 25 years old, 34% of women had HSV 2 antibodies suggesting that HSV 2 infection occurs during the first few years following sexual debut. It is likely that an increase in prevalence with age also represents new infections occurring at older age. Information on age and prevalence of HSV 2 is essential to optimise control strategies.

Participants who reported having two or more lifetime sexual partners were more likely to be diagnosed with HSV 2 than those who reported only one lifetime sexual partner. The association between lifetime number of sexual partners and HSV 2 is consistent with other studies and this indicates a measure of increased sexual activity.

In other sero prevalent studies socio-demographic markers such as married or cohabitating was associated with an increase risk of HSV 2 infection. This study affirms these findings, being married or cohabitating was statistically significant with HSV 2 sero prevalent of 86.37% women that were married or cohabitating were HSV 2 positive as compared to 13.63% of women who were single or never married. This finding is more likely to be due to changes in relationship and family structure with an increasing proportion of adults outside of long term monogamous relationships. Over the life course relationship changes due to divorce, separation or death which leads to new patterns of casual dating, short term monogamous relationships or remarriage.

A high percentage of not using condoms with HSV 2 prevalence (69.8%) was noted when compared to always using condoms (44.4%). This explains that women are not always able to negotiate condom use, although consistent and correct use of condoms by men remains the most effective form of protection from acquiring STIs. Possible reasons for women not being able to negotiate condom use maybe because of socio-cultural constraints and power differentiates in gender roles. A study by Wald et al (2005), showed that participants reporting more condom use (condom use for >75% of sexual acts) were at a lower risk of acquiring HSV 2 (95%, CI:0.6 to 0.9).

5.4 CONCLUSION

In summary the prevalence of HSV 2 2 infection was high in the studied population. Potential risk factors that influenced HSV 2 transmission rates have been identified and this were categorised as biological behavioural and socio-demographical aspects. These risk factors could be an indication of population subgroups that are likely to have acquired or are at high risk of acquiring HSV 2. Important associated co-factors of HSV 2 infection include females, history of STIs and having more than one sexual partner and added to this is low level of education and age related factors. In addition this data supports an important role of HSV 2 in facilitating HIV 1 transmission and acquisition. Understanding and identifying these risk factors may assist in interventions and programmes to reduce HSV 2 transmission and acquisition.

The findings in this study have important public health implications in South Africa, being a country that’s greatly hit by the HIV epidemic. Therefore multifaceted interventions are needed to improve recognition of genital herpes and also to prevent

it's potential to promote HIV transmission.The high prevalence of HSV 2, almost 82% of woman in sub-Saharan Africa, and a strong association between HSV 2 and HIV is an important public health implication even more so in in this country whereby approximately 5,24 million are infected by HIV and more importantly testing for HSV 2 is not a routine requirement in the management of sexually transmitted diseases.

5.5 RECOMMENDATIONS

It is recommended that primaryprevalence studies be conducted on HSV2 in different provinces as data analysed in this study was restricted to one province only therefore for generalisability to the entire country.The most cost effective intervention of curbing the transmission and acquisition of all STIs is primary prevention. Given the epidemic of HSV 2 acquisition as primarily an incident infection among young adults, this group should be prioritised especially in resource poor settings where incidence and prevalence remains highest.

Primary prevention should include the following:

- A need to recognise HSV2 infection among populations at risk and to provide treatment and counseling on condom use.
- Priority to be given to integrate HSV2 and HIV1 prevention efforts in high risk populations given the strong association of HSV2 and HIV infections.

5.6 CONTRIBUTION OF THE STUDY

This study showed high prevalence rate of HSV 2 and associated risk factors, which is in keeping with high prevalence of HSV 2 globally. Primary prevention of HSV 2 infection might be the only available strategy to reduce the risk for HIV and STI infection associated with HSV 2. Therefore increasing the awareness of the high HSV 2 prevalence in South Africa and the link between HSV 2 and HIV infections are important first steps in addressing the epidemic. The findings of this study should contribute significantly to the existing knowledge on the association of HIV and HSV 2 including the association with other STIs. Moreover the findings should assist and encourage for a review of current health policies to adopt serologic screening for HSV 2 among high risk populations when screening for other STIs .Lastly findings of the study have public

health implications if a high prevalence of HSV 2 in the South African population is noted hence recommending research into development of an HSV 2 vaccine should continue which is more likely to result in a more effective preventive measure in the future.

5.7 LIMITATIONS

The following limitations relates to the primary study which contributed to the subset of data used for this analysis.

The study was restricted to certain areas of South Africa only and the data is based on women participating in clinical trials, this limiting generalisability of HSV 2 infection rates to the general population. This is selection bias because the women who opted to join a clinical trial maybe different from women in the general communities in possibly significant ways. The selection of women participating only may result in misclassification bias whereby this creates a construct to categorise women as having positive/negative and high /low outcomes than compared to males thus a possibility of misclassifying women.

A further limitation of this study was the inability to determine temporal relationships of HIV, STIs and HSV 2 infection. The study also relied on self reported sexual behaviour, which is subject or recall bias and social desirability bias in the case of sexual behaviour.

This study deals with secondary analyses of data, however, this is valuable data for analysis as not many recent studies on HSV 2 prevalence and associated risk factors are available regarding the South African population.

5.8 CONCLUDING REMARKS

The aim of this study was to determine HSV 2 prevalence and co-occurring infection and its correlates with socio-demographic and behaviour variables which the researcher was able to identify and analyse.

This study showed a high prevalence of HSV 2 infection and a strong association of HSV 2 and HIV. A significant association of HSV 2 was noted in women having more than 2 sex partners and lower high school education. Therefore, it is recommended that screening for HSV 2 among high risk populations be incorporated into the STI screening and treatment packages.

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